

Service Manual

Tiltrotator/Rotator EC/ECR10–30



The noble art of digging

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Safety regulations

General information

Key to terms

In this service manual, the terms CAUTION, NB: and NOTE: are used as follows:



CAUTION

The term CAUTION signifies that incorrect procedures can cause personal injury.

NB:

The term NB: signifies that incorrect procedures can cause material damage.

NOTE:

The term NOTE: highlights important user instructions.

The service manual describes the repair and inspection operations that can be performed on tiltrotators/rotators ec 10–30. The safety regulations apply regardless of which base machine is used.

Also see the safety instructions for the base machine and other equipment used. Also see the safety information in the instruction manual.

Make sure you have read and understood all the cautions before undertaking any maintenance operations. The cautions explain potential risks and how to avoid them.

If in any doubt, contact your employer or the supplier. Expert advice can eliminate many unnecessary risks.

Cautions



CAUTION

Incorrect installation can pose a safety risk. If in any doubt, contact an engcon dealer or engcon Nordic AB.



CAUTION

Make sure that the hydraulic system is free of pressure before starting work on the system. Risk of personal injury.



CAUTION

Switch off the power when working with the electrical system and remove rings, watches etc. before starting work. Risk of personal injury.



CAUTION

Never use your hands to check for leaks in the hydraulic system. Hydraulic oil under pressure can penetrate your skin causing serious injury.



CAUTION

Implements connected to the tiltrotator may not be used under any circumstances unless correctly locked into place. **ALWAYS** make sure that the lock bolts protrude according to the specification for the relevant quick hitch.



CAUTION

Never attempt to upgrade the equipment's maximum capacity by making modifications without the supplier's approval.



CAUTION

Short circuits in electrical cables can cause injury and burning. Insulate electrical conductors and parts carefully when installing electrical equipment.



CAUTION

Risk of burn injuries from hot hydraulic oil.



CAUTION

The machine must never be operated with the implement lock switch turned on, except when attaching or detaching a bucket or implement.



CAUTION

If in any doubt regarding the machinery or the safety features, contact an engcon dealer or engcon Nordic AB.



CAUTION

Risk of catching in moving parts.

Technical data

General data

		EC10	EC15	EC20	EC30
Max. machine size	[kg]	12 000	16 000	22 000	32 000
Max. breakout	[kNm]	90	130	180	240
Max. bucket width	[mm]	1400	1600	1700	2200
Max. hydraulic pressure	[MPa]	22,5	22,5	22,5	22,5
Min./max. hydraulic flow	[l/min]	30/60	40/70	50/80	50/100
Max. rec. pressure in return line	[MPa]	02.05	02.05	2,5	02.05
Weight	[kg]*	210	340	485	780
Width A	[mm]*	320	320	450	500
Width B	[mm]*	245	245	300	390
Width C	[mm]*	290	307	310	390
Total length D	[mm]*	540	698	890	970
Build height E	[mm]*	390	420	440	520
Max. width	[mm]*	640	680	720	920
Swivel channel extra function, number of couplings		2 (4)	2 (4)	2 (4)	2 (4)
Swivel channel lock function, number of couplings		2	2	2	2
Rotation		Infinite	Infinite	Infinite	Infinite
Tilt angle	[°]	2x40	2x40	2x40	2x40
Tilt time, hydraulic flow	[s / l/min]	5/19	5/21	5/48	5/75
Rotation time for one rotation, hydraulic flow	[s / l/min]	7/50	7/61	7/70	7/64
Hydraulic motor Char-Lynn T line	[cm³]	131	131	157	157
Standard mountings	–	S40	–	–	–

*Depends on coupling

← From machine

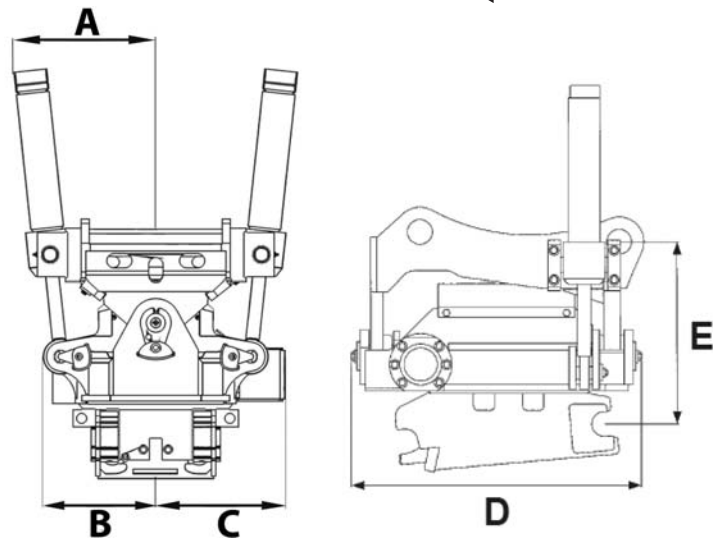


Fig. 1. Measurement table

Tightening

The rotator is dimensioned to withstand heavy strain from breakout and rotation. Tightening of certain screw joints is vital to ensure optimum durability. Screws and thread holes must be kept very clean and the threads well lubricated.

Screw dimension	8.8 Type	12.9 Type
M5	5.7 Nm	9.7 Nm
M10	47 Nm	80 Nm
M12	81 Nm	140 Nm
M16	197 Nm	333 Nm
M20	385 Nm	649 Nm

The screws for the hitch, centre ring and yoke couplings must be replaced during servicing.

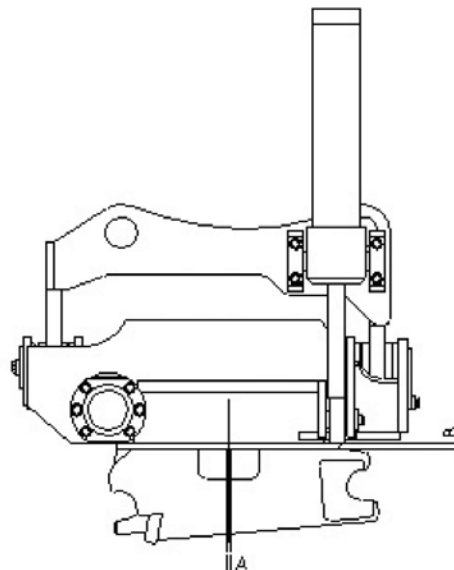
The replacement screws should be of the same type as the previous screws.

Permitted play

	Axialglapp snäckskruv A	Axialglapp snäckhjul B
EC10	Max. 0.6 mm	Max. 0.4 mm
EC15	Max. 0.6 mm	Max. 0.4 mm
EC20	Max. 0.8 mm	Max. 0.4 mm
EC30	Max. 0.8 mm	Max. 0.4 mm

NOTE:

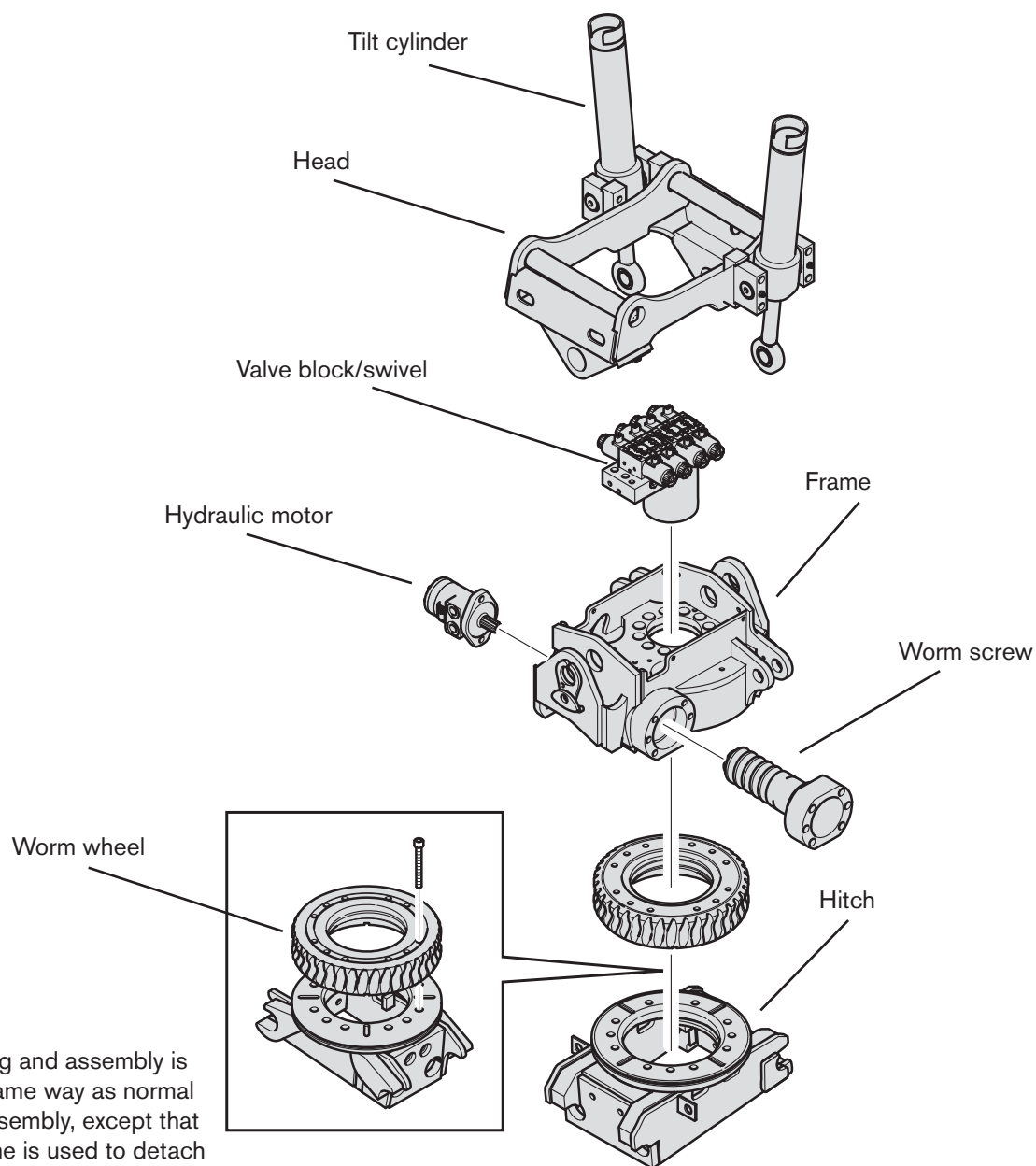
After shimming, the values should be between 0.1 mm and 0.2 mm.



- A. Axial play, worm screw.
- B. Axial play, worm wheel.

Fig. 2. Overview, play

Tiltrotator/Rotator EC10-30



Reverse dismantling and assembly is performed in the same way as normal dismantling and assembly, except that the plug in the frame is used to detach the hitch.

Fig. 3. Assembly diagram, rotator EC10-30

Tilt cylinder Removal

**CAUTION**

Make sure that the hydraulic system is free of pressure before starting work.
Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

1. Clean the tilt cylinder and its hydraulic connections.
2. Mark the positions of the two hydraulic tubes.
3. Disconnect the hydraulic tubes connected to the tilt cylinder.
4. Plug all open connections.

**CAUTION**

Risk of catching in moving parts.

5. Remove the lock screw on the cylinder shaft and remove the cylinder shaft.

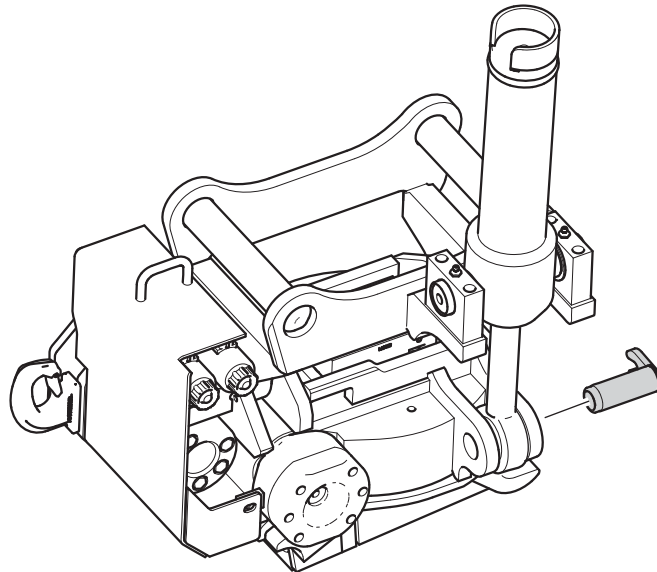


Fig. 4. Cylinder shaft

6. Disconnect the yoke coupling turned away from the machine and remove the tilt cylinder.

Dismantling

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

1. Clean the outside of the cylinder.
2. Clamp the cylinder in a vice.
3. Remove the cylinder nut and empty the remaining oil from the cylinder.
4. Pull out the piston rod along with its seals.

NOTE:

The piston is fixed with Loctite. If necessary, heat gently to facilitate removal.

5. Remove the piston from the piston rod.
6. Remove the cylinder nut from the piston rod.

Assembly

1. Check the piston rod, piston and cylinder for damage or scratches.
2. Replace all seals.

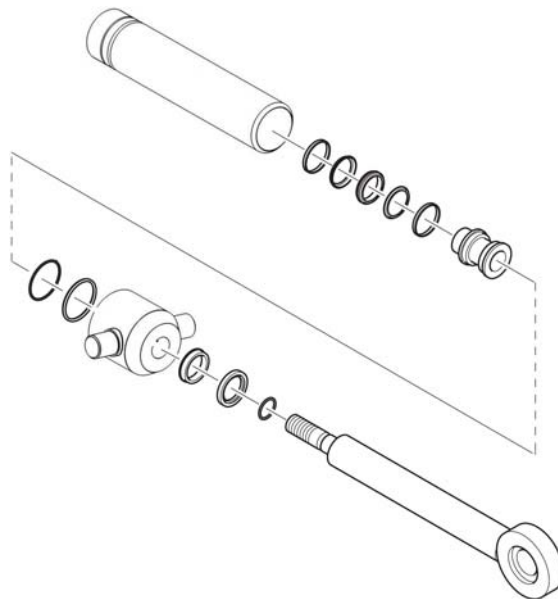


Fig. 5. Tilt cylinder, assembly diagram

3. Lubricate the seals in the cylinder nut with clean hydraulic oil and thread it onto the piston rod.
4. Apply lock solution to the piston and mount it on the piston rod.
5. Make a punch mark on the bottom between the piston and the piston rod to secure the piston.
6. Lubricate the new seals on the piston with clean hydraulic oil and push the piston rod into the cylinder.
7. Screw the cylinder nut into place.

Attachment

1. Attach the tilt cylinder to the yoke coupling that is turned towards the machine.
2. Screw the yoke coupling that is turned away from the machine into place.

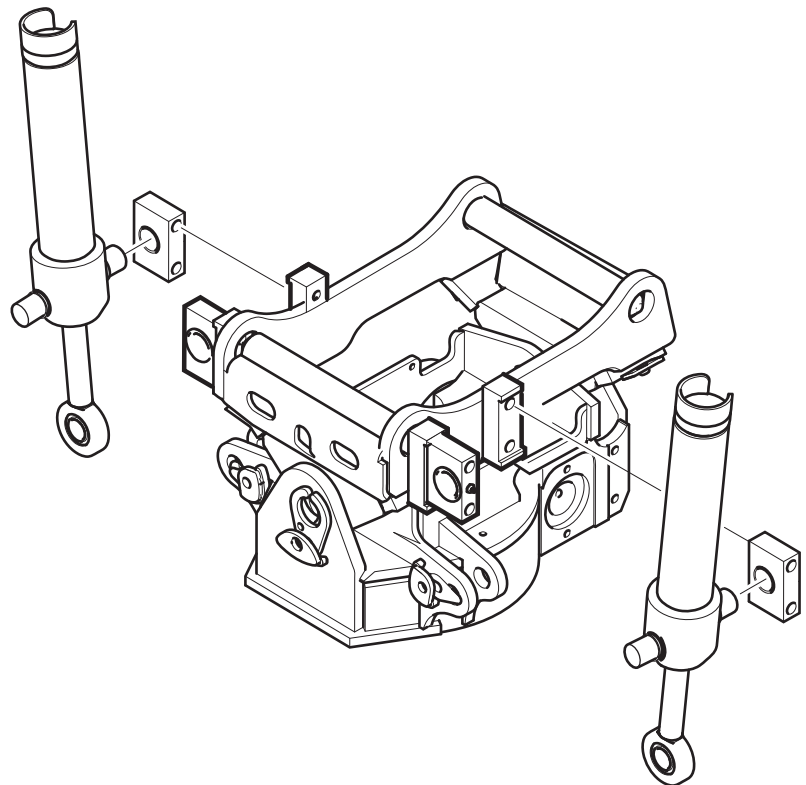


Fig. 6. Tilt cylinder

3. Attach the cylinder shaft and the lock screw.
4. Connect the hydraulic tubes to the tilt cylinder, following the markings made earlier.
5. Lubricate the tiltrotator. See the lubrication schedule in the instruction manual.

Grab cylinder

Removal



CAUTION

Make sure that the hydraulic system is free of pressure before starting work.
Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

1. Clean the grab cylinder and its hydraulic connections.
2. Mark the positions of the two hydraulic tubes.
3. Remove the hydraulic tubes.
4. Plug all open connections.
5. Remove the lock screw for the grab cylinder's shaft.
6. Remove the shaft and the grab cylinder with spacers.

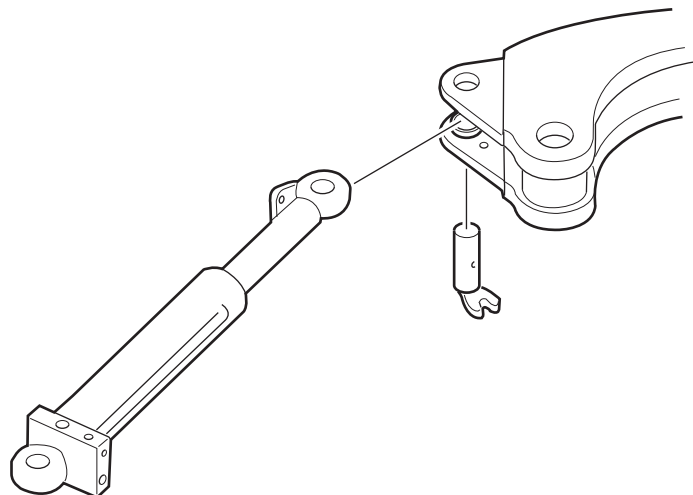


Fig. 7. Grab cylinder

7. Remove the nut on the rear coupling.
8. Remove the cylinder.
9. Remove the grab guard.

Dismantling

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

1. Clean the outside of the cylinder.
2. Clamp the cylinder in a vice.
3. Remove the check valve and the plug.

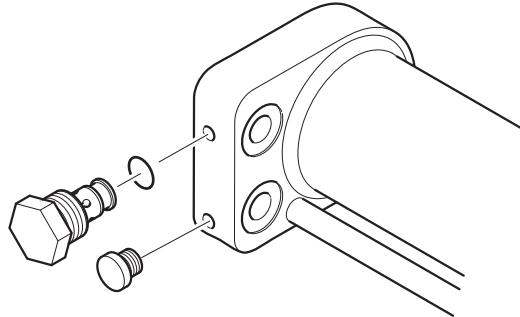


Fig. 8. Plug and check valve, grab cylinder

4. Undo the cylinder nut.
5. Pull out the piston rod along with its seals.

NOTE:

The piston is fixed into place with Loctite. If necessary, heat gently to facilitate removal.

6. Disconnect the piston from the piston rod.
7. Remove the cylinder nut from the piston rod.

Assembly

1. Check the piston rod, piston and cylinder for damage or scratches.
Replace any damaged parts.
2. Replace all seals.

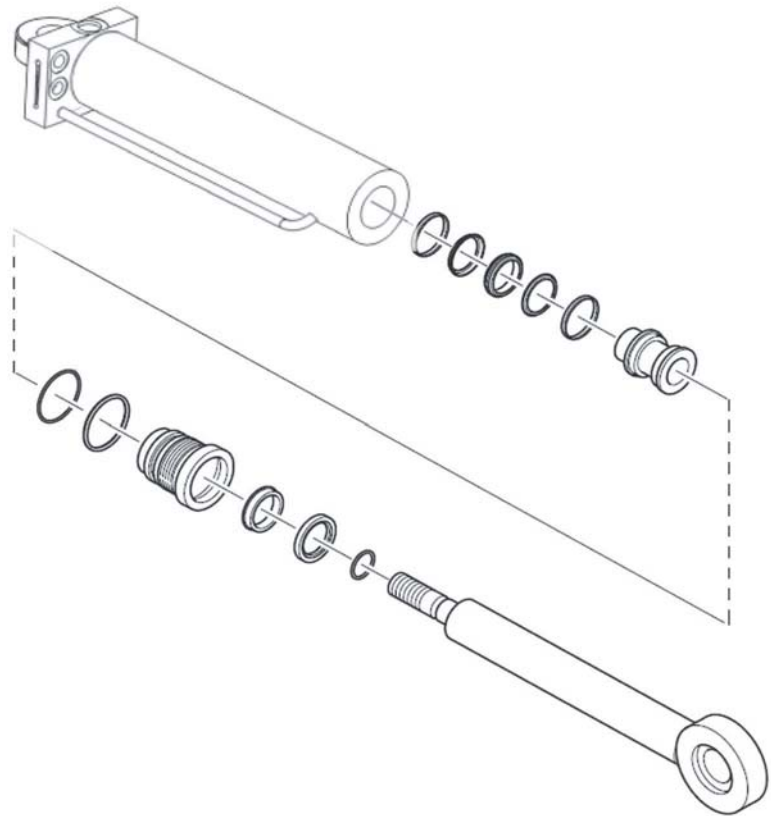


Fig. 9. Grab cylinder, diagram

3. Lubricate the seals in the cylinder nut with clean hydraulic oil and replace it on the piston rod.
4. Apply lock solution to the piston and attach it to the piston rod.
5. Make a punch mark on the bottom between the piston and the piston rod to secure the piston.
6. Lubricate the new seals on the piston with clean hydraulic oil and insert the piston rod into the cylinder.
7. Screw the cylinder nut into place.
8. Attach the plug with a new O-ring.
9. Attach the check valve with a new O-ring.

Attachment

1. Attach the grab guard.
2. Attach the grab cylinder.
3. Attach the nut for the rear coupling.
4. Attach the shaft for the grab cylinder with spacers and a lock screw.

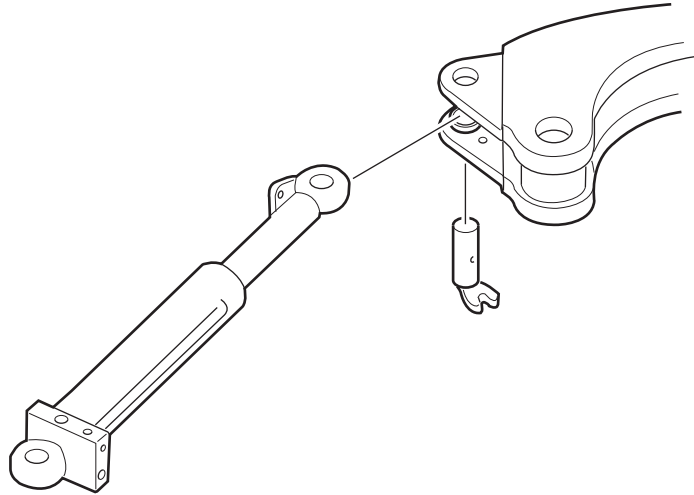


Fig. 10. Grab cylinder

5. Connect the hydraulic tubes, following the markings made earlier.
6. Lubricate the tiltrotator. See the lubrication schedule in the instruction manual.

Directional valve

Removal



CAUTION

Make sure that the hydraulic system is free of pressure before starting work.
Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

1. Remove the cover over the directional valves.
2. Mark the positions of the power plugs.
3. Disconnect the power plugs on the directional valves.

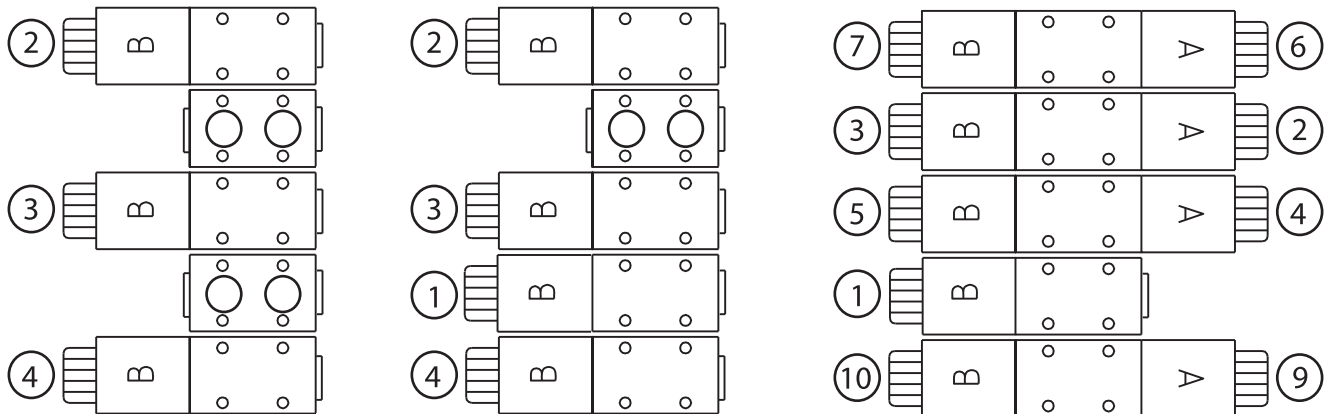


Fig. 11. Marking, power plugs (variations may occur)

4. Remove the directional valves.
5. Plug all open connections.
6. Remove the plastic nut on the electromagnet and pull it off the directional valve.

NOTE:

Reserve the O-rings for later.

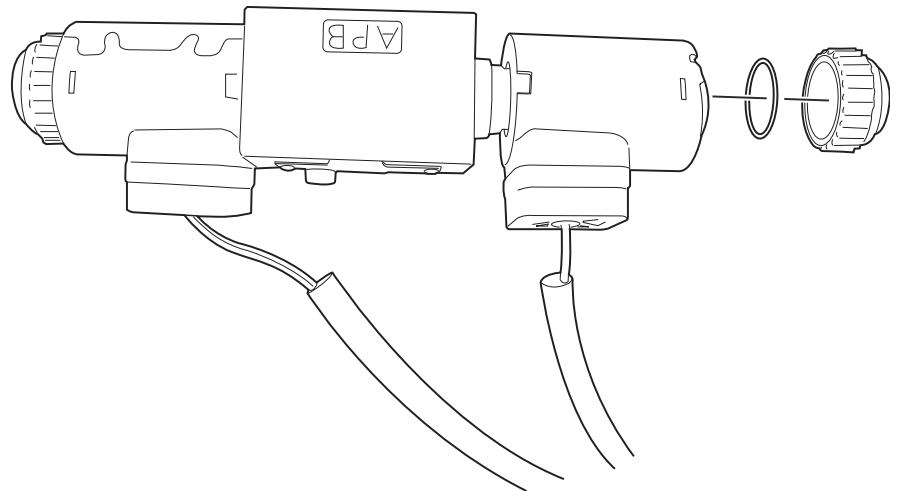


Fig. 12. Directional valve

7. Replace any damaged parts.

Attachment

1. Attach the electromagnets on the directional valve.
2. Lubricate the O-ring, thread it onto the directional valve and attach the plastic nut.

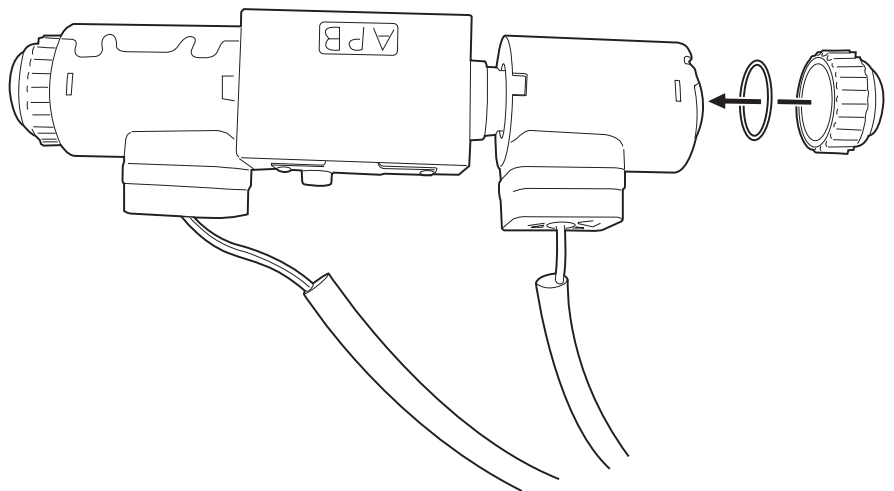


Fig. 13. Directional valve

3. Attach the directional valve on the valve block. Check that all O-rings are correctly in place.
4. Connect the power plugs to the electromagnets, following the markings made earlier.
5. Make sure that the cables are positioned correctly and not rubbing against any sharp edges.
6. Put the cover over the directional valves.

Head Removal



CAUTION

Make sure that the hydraulic system is free of pressure before starting work. Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

1. Perform steps 1–5 according to the instructions in the section Tilt cylinder, Removal.
2. Remove the tilt shafts, using a hammer puller if necessary.
3. Lift off the head. Reserve the shims for later.
4. Check the head and mountings for cracks and other damage. Replace or repair if necessary.
5. Knock out any worn bushes and replace them with new ones, using a suitable tool.

Attachment

1. Lubricate the bushes for the tilt shafts.
2. Lift the head into place and attach the tilt shaft that is turned away from the base machine.
3. Attach the tilt shaft that is turned towards the machine, and push it in until it reaches to the inner edge of the shaft hole in the head.

NB:

Do not use shims on the front end. Risk of material damage.

4. Shim the head into place with the shims on the inside at the rear end.

NOTE:

There must be no perceivable play after attachment and shimming.

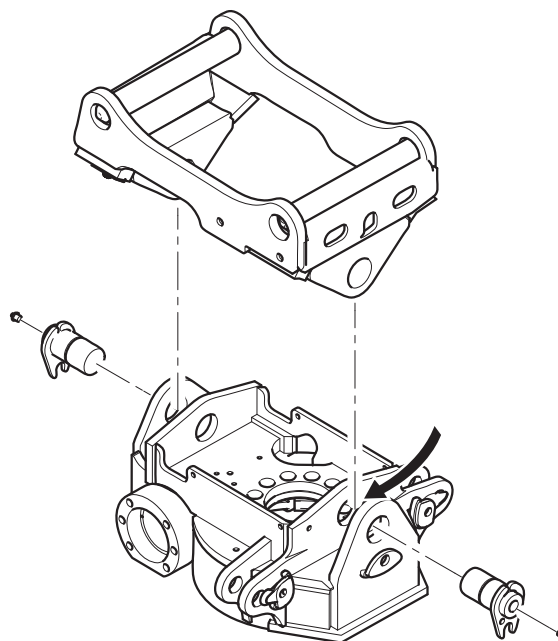


Fig. 14. Shimming, head

5. Attach the lock screw for the tilt shafts.
6. Perform steps 1–5 according to the instructions in the section Tilt cylinder, Attachment.

Hydraulic motor

Removal



CAUTION

Make sure that the hydraulic system is free of pressure before starting work.
Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

NOTE:

Dismantling instructions for each type of hydraulic motor are included with the seal kit when spare parts are ordered.

1. Remove the motor guard.
2. Mark the hydraulic tubes connected to the motor.
3. Remove the hydraulic tubes.
4. Plug all open connections.
5. Undo the screws on the motor and remove the motor.

Attachment

1. Attach the motor in the frame and tighten the screws.
2. Attach the hydraulic tubes to the motor, following the markings made earlier.
3. Attach the motor guard.

Worm screw Removal



CAUTION

Make sure that the hydraulic system is free of pressure before starting work.
Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

NOTE:

The number of washers and shims may vary depending on the model.

1. Remove the motor according to the instructions in the section Hydraulic motor, Removal.
2. Remove the screw housing, shims and axial washer.
3. Remove the worm screw.
4. Remove the axial washer and the support ring.
5. Check all wear parts for damage and wear. Replace any damaged parts.
- 6- Knock out the bushes for the worm screw and attach new ones using a suitable tool.

Attachment

NB:

The guide pin in the frame should be aligned with the notches in the support ring and axial washer.

NOTE:

The number of washers and shims may vary depending on the model.

1. Attach the support ring and the axial washer.

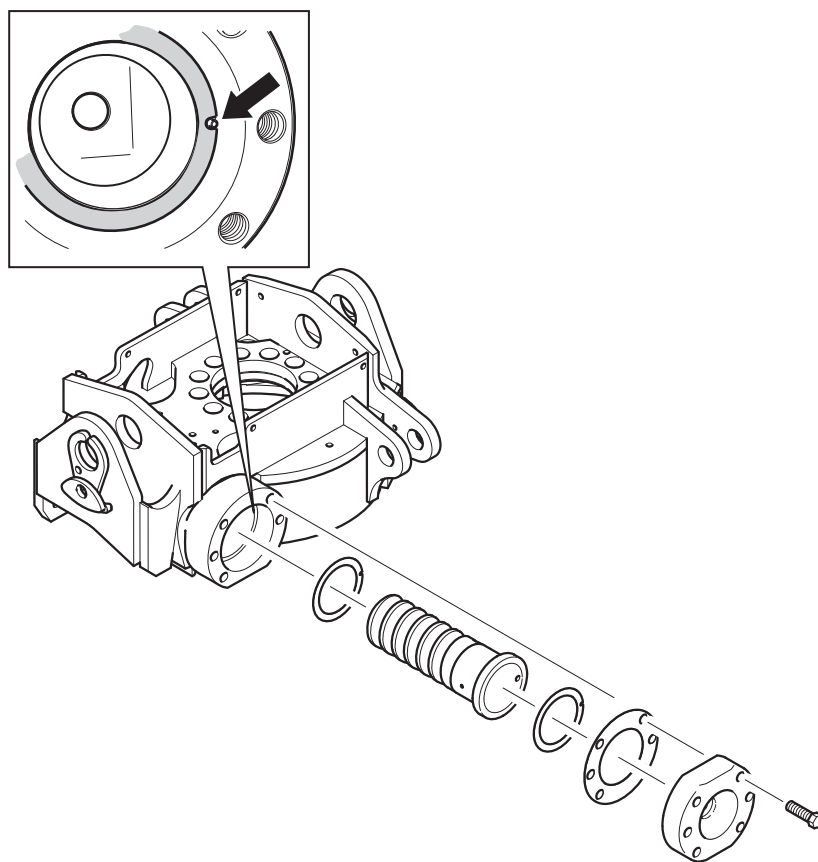


Fig. 15. Guide pin, frame

2. Attach the worm screw, making sure that the support ring and the axial washer do not slip out of place.

NB:

The guide pin in the screw housing should fit the axial washer.

3. Attach the axial washer, shims and screw housing for the worm screw.

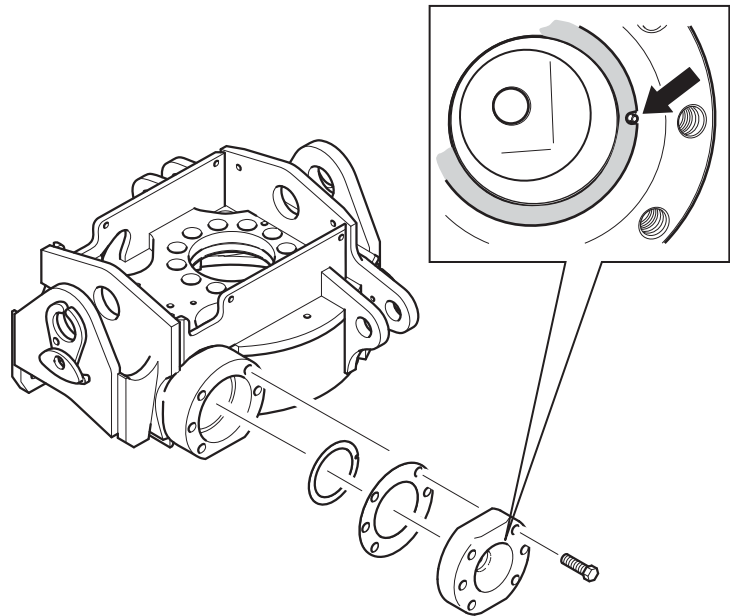


Fig. 16. Guide pin, screw housing

4. Turn the lower part clockwise to make sure that the worm screw reaches to the bottom.
5. Install the indicator and the tool in the grease nipple hole in the screw housing. Set the indicator to zero.

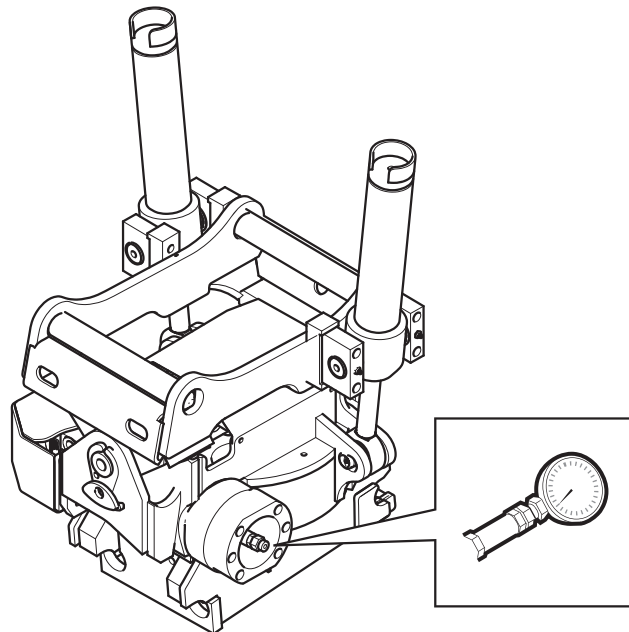


Fig. 17. Installation, indicator

Worm screw

NOTE:

While checking the play, make sure that the lower part and frame do not rotate in relation to each other.

6. Turn the lower part clockwise. Check that the play is within the specified tolerance. If there is too much play, the worm screw must be reshimmed.
7. Remove the indicator with a suitable tool and install the grease nipple in the screw housing.
8. Attach the motor according to the instructions in the section Hydraulic motor, Attachment.

Worm wheel

Removal



CAUTION

Make sure that the hydraulic system is free of pressure before starting work.
Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

1. Perform steps 1–5 according to the instructions in the section Head, Removal.
2. Remove the cover over the directional valves.
3. Mark the positions of the power plugs on the directional valves.
4. Remove the power plugs. Remove the directional valves.
5. Plug all open connections.
6. Disconnect the unit cable on the unit box.
7. Remove the unit box.
8. Remove the motor guard.
9. Mark the positions of the hydraulic tubes on the motor.
10. Remove the hydraulic tubes.
11. Plug all open connections.
12. Undo the two screws on the motor and remove the motor.
13. Remove the indicator rod.
14. Remove the tool springs by bending them upwards. Hold the springs firmly in place to avoid losing them.
15. Remove the guide pins from the locking wedges.
16. Remove the screws from the lock cylinders.
17. Mark the position of the hydraulic tubes on the lock cylinders.
18. Remove the hydraulic tubes.
19. Plug all open connections.
20. Ta bort låscylinder med låstappar.
21. Remove the lock cylinder and latch bolts.
22. Plug all open connections.
23. Remove the connector block on the swivel and lock tubes.
24. Plug any open connections.
25. Undo the screws for the hitch and remove it.
26. Remove the screw housing, shims and axial washer.
27. Remove the worm screw.
28. Remove the axial washer and the support ring.

Worm wheel

29. Remove the lock clasp (applies to ec 10 only) and the screws for the valve block.
30. Remove the valve block with the swivel.

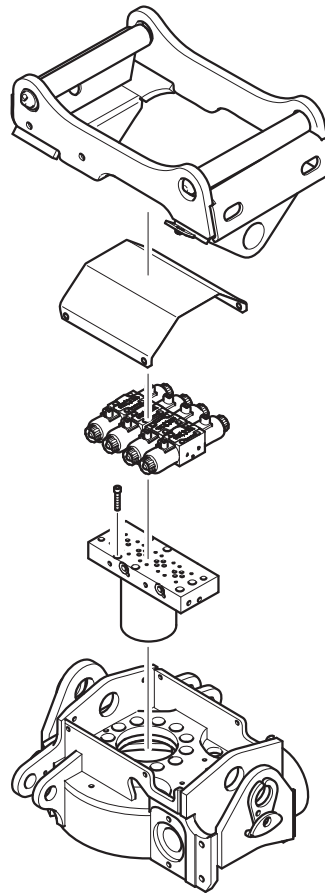


Fig. 18. Valve block/swivel

31. Remove the screws for the centre ring.
32. Lift off the centre ring and worm wheel.
33. Separate the worm wheel from the centre ring.
34. Remove the shims.
35. Remove the wear washer.
36. Check all wear parts for damage and wear. Replace any damaged or worn parts. Replace all seals. If there is too much play between worm screw and worm wheel, the play can be reduced by turning the worm wheel half a turn.

Attachment

1. Attach the wear washer. Make sure the wear washer is turned so that it aligns with the lubrication holes in the frame. Use lock solution.

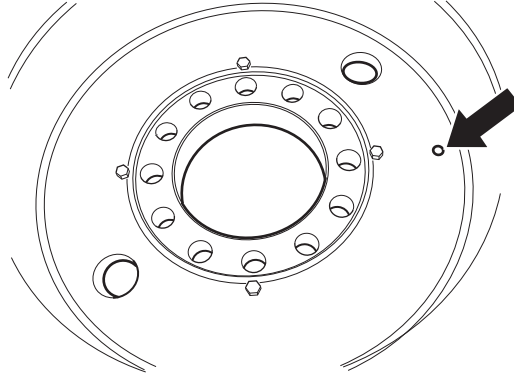


Fig. 19. Lubrication groove, frame

2. Attach shims.

NOTE:

Some models have rod bolts. Four rod bolts should be used for this type of worm wheel. Fix them into place with lock solution and screw them into the worm wheel until they protrude roughly 52 mm (EC10) or 57 mm (EC15) above the worm wheel.

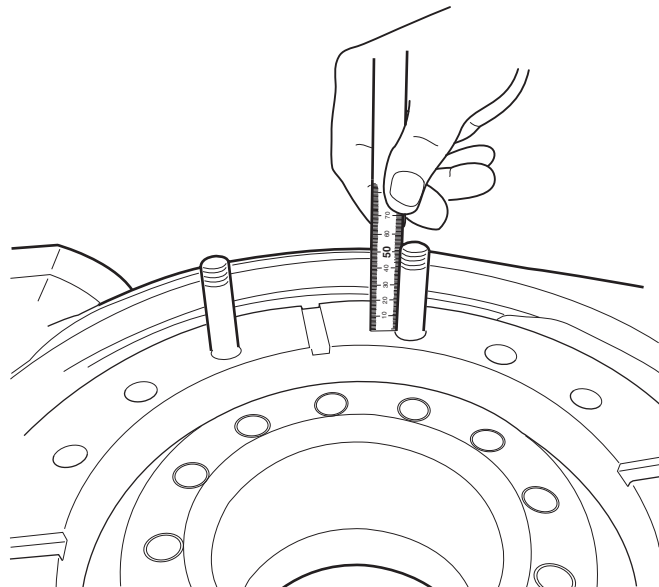


Fig. 20. Rod bolts, worm wheel

3. Lubricate the wear washer and attach the worm wheel. If the worm wheel has rod bolts, make sure they are in the “quarter-to-three” position.

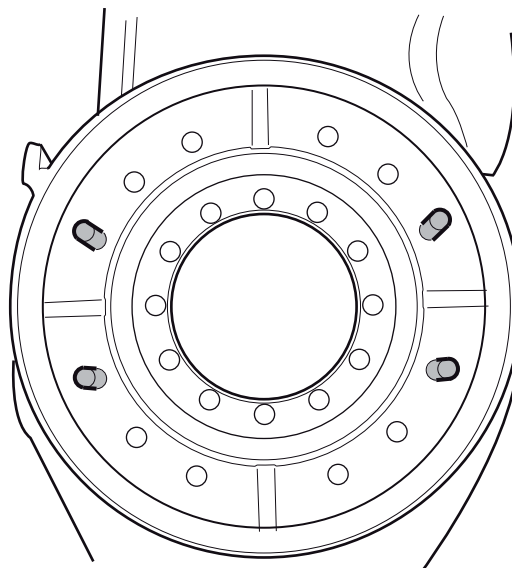


Fig. 21. Positioning, rod bolts

4. Attach the O-ring (does not apply to ec15) and the centre ring and tighten them gradually, alternating between them. Insert the lubrication screw into the screw hole as marked.
5. Remove the plug from the frame.
6. Install the dial indicator and the tool into the plug hole. Set the dial indicator to zero.

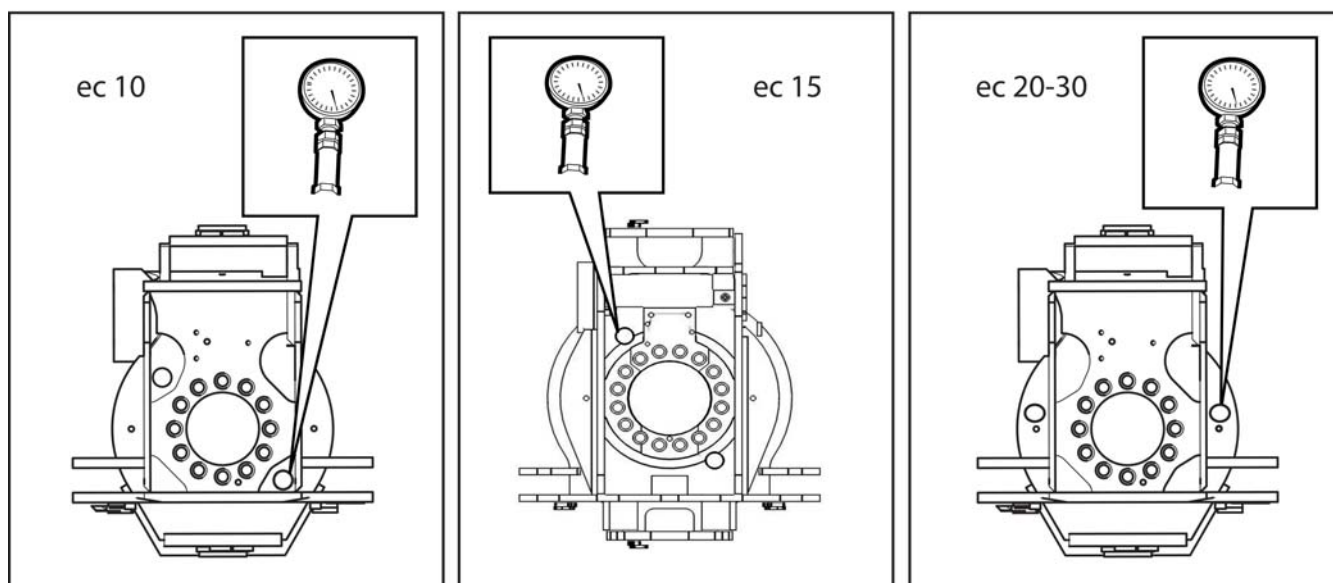
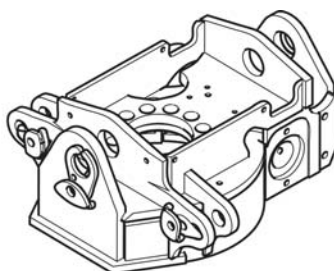


Fig. 22. Dial indicator

7. Insert a screw into the worm wheel to keep the iron bar in place.
8. Measure the axial play around the worm wheel by pushing the bar against the screw. Check the maximum permitted play in the technical data for the relevant model. If the play exceeds the tolerance, the rotator must be reshimmed.
9. Remove the dial indicator with a suitable tool and replace the plug in the frame.
10. Attach the valve block with the swivel, turning the connections away from the machine.

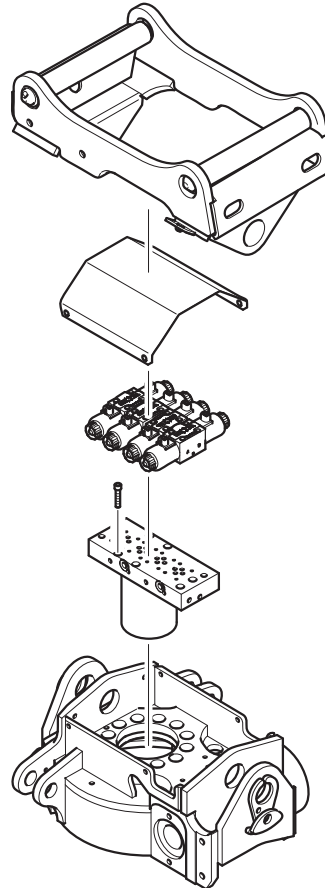


Fig. 23. Valve block/swivel

11. Attach the lock clasp (EC10) for the valve block.

NB:

The guide pin in the frame should be aligned with the notches in the support ring and the axial washer.

12. Attach the support ring and the axial washer.

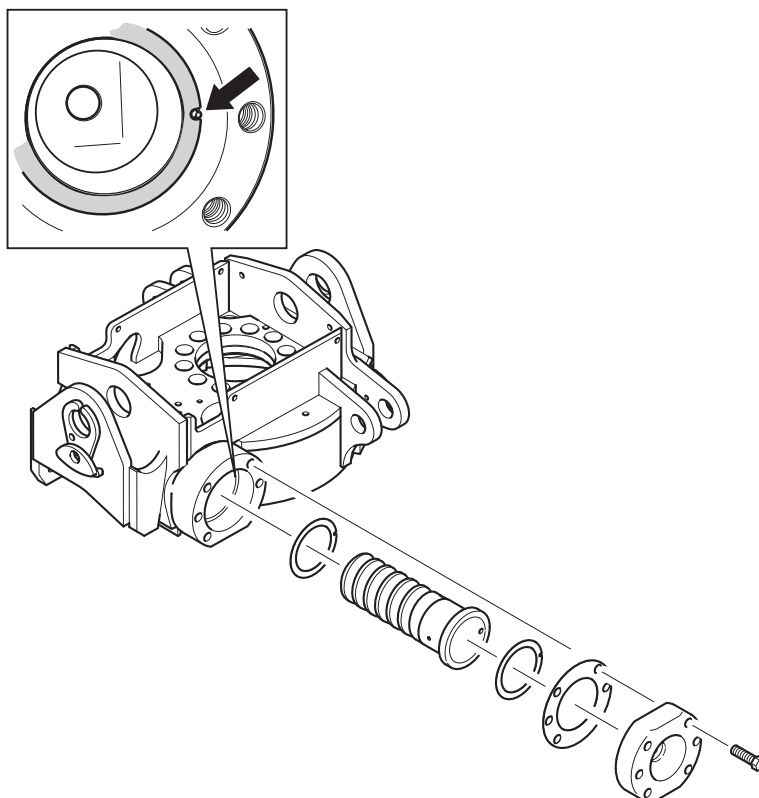


Fig. 24. Guide pin in frame

13. Attach the worm screw. Make sure that the support ring and the axial washer do not slip out of place.

NB:

The guide pin in the screw housing should fit the axial washer.

14. Attach the axial washer, shims and screw housing for the worm screw.

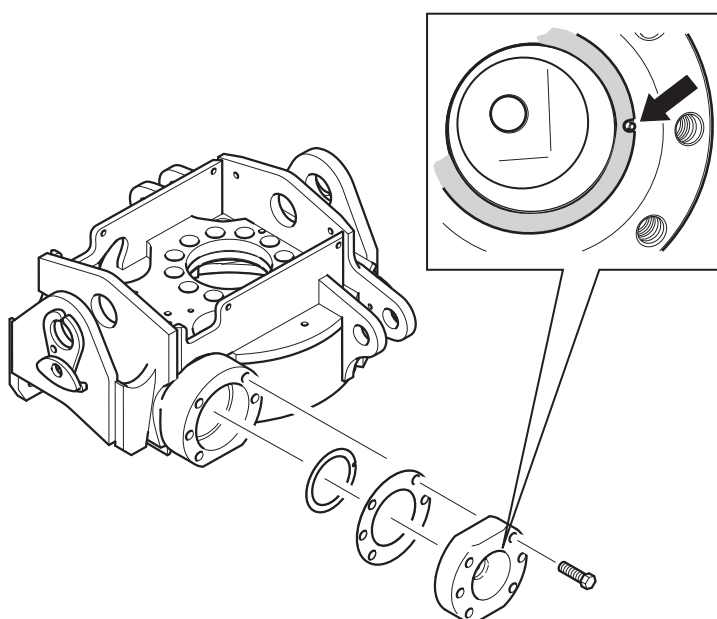


Fig. 25. Guide pin in screw housing

15. Turn worm wheel clockwise.
16. Install the dial indicator in the hole for the grease nipple in the screw housing, using an appropriate tool. Set the dial indicator to zero.

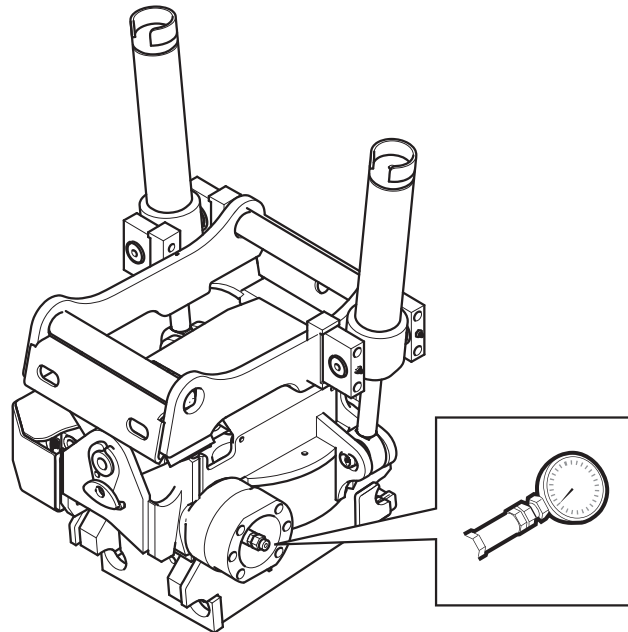


Fig. 26. Installation dial indicator

NOTE:

While checking the axial play, make sure the worm wheel and worm screw do not move in relation to each other.

17. Turn the worm wheel clockwise and check the axial play. Check the maximum permitted play in the technical data. Reshim if necessary.
18. Check that all flanges at wedges are correctly in place.
19. Lubricate the O-ring.
20. Attach the hitch. The couplings for extra equipment should be turned away from the machine.
21. Attach the screws on the hitch and gradually tighten the screws, alternating between them.
22. Attach the connector block for the swivel. The number "1" on the swivel should be turned towards the machine.

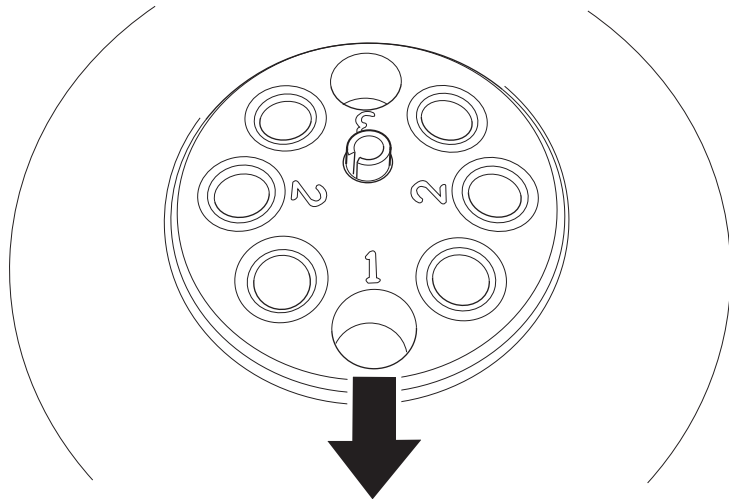


Fig. 27. Marking, swivel

23. Attach the tubes for the extra couplings.
24. Attach the lock cylinder with latch bolts.
25. Connect the tubes to the lock cylinder, following the markings made earlier.
26. Attach the hitch for the lock cylinders.
27. Attach the guide pins on the locking wedges.
28. Attach the tool springs, using a suitable tool to guide them into place.
29. Attach the indicator rod.
30. Attach the motor.
31. Attach the tubes to the motor, following the markings made earlier.
32. Attach the motor guard.
33. Attach the unit box.
34. Connect the unit cable to the unit box.
35. Attach the directional valves. The writing should be clearly legible from the machine.
36. Connect the power plugs on the directional valves.

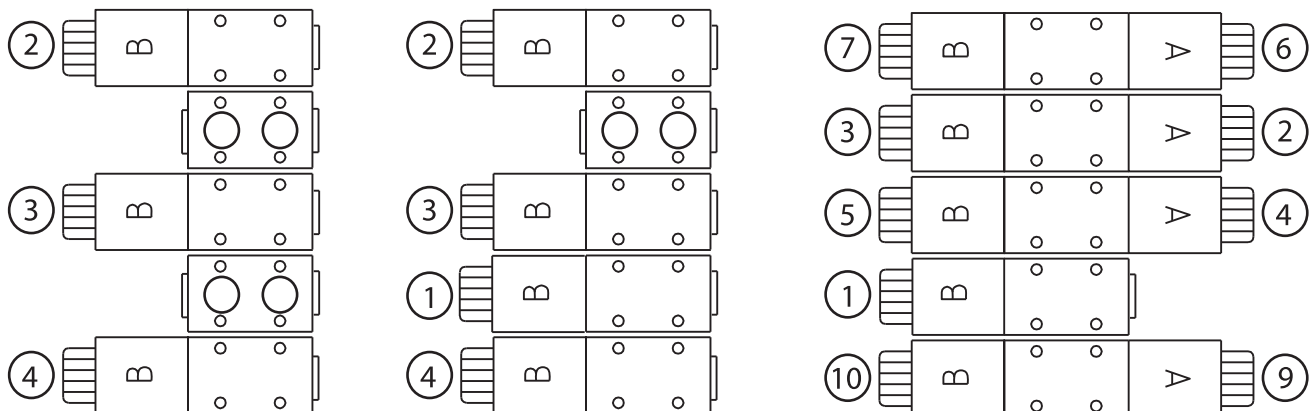


Fig. 28. Marking, power plugs (variations may occur)

37. Put the cover into place over the directional valves.
38. Perform steps 1–6 according to the instructions in the section Head, Attachment.

Shimming



CAUTION

Make sure that the hydraulic system is free of pressure before starting work. Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

1. Perform steps 1–5 according to the instructions in the section Worm screw, Removal.
2. Remove the cover over the directional valves.
3. Mark the positions of the power plugs on the directional valves, then disconnect them.
4. Remove the directional valves.
5. Plug all open connections.
6. Remove the valve package by disconnecting the swivel.
7. Plug all open connections.
8. Remove the plug(s) in the frame.
9. Undo the screws on the centre ring.

NOTE:

Take care not to damage the swivel.

10. Lift off the frame.
11. Remove the shim.
12. Check all wear parts for damage and wear. Replace any damaged or worn parts. Replace any damaged seals.
13. Attach the shim. Check that the lubrication hole in the frame is aligned with the hole in the shim.

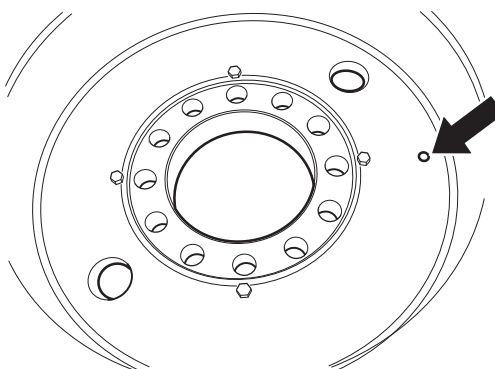


Fig. 29. Lubrication hole, frame

ANM!

Take care not to damage the swivel.

14. Replace the frame.
15. Install the screws on the centre ring and gradually tighten them, alternating between them.
16. Connect the swivel with the valve package for the frame.
17. Check that none of the screw holes in the worm wheel are directly in front of the plug hole.

NB:

Never allow to rotate with a tool attached.

18. Install the dial indicator and the tool in the hole for the plug. Set the indicator to zero with the rotator resting on the supporting surface.

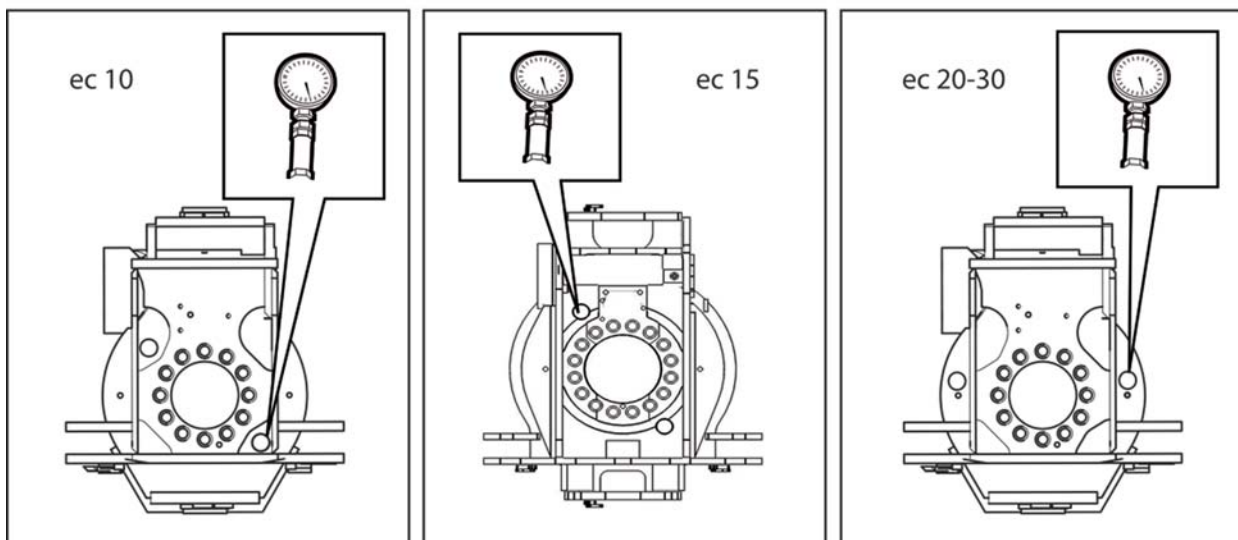
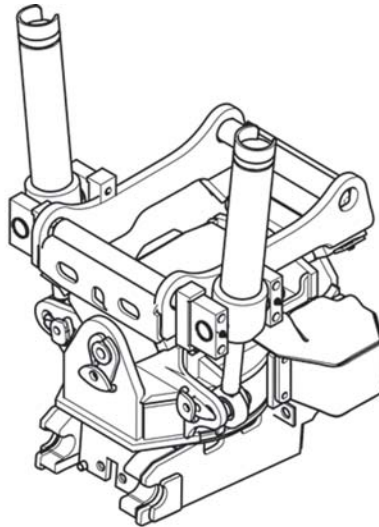


Fig. 30. Dial Indicator

19. Check the play by lifting the rotator up from the supporting surface. Probe with an iron bar between the hitch and frame to make sure that there is room for the maximum play. Check that the play is within the indicated tolerance.
20. Attach the plug(s) in the frame.
21. Attach the directional valves.

22. Connect the power plugs on the directional valves, following the markings made earlier.

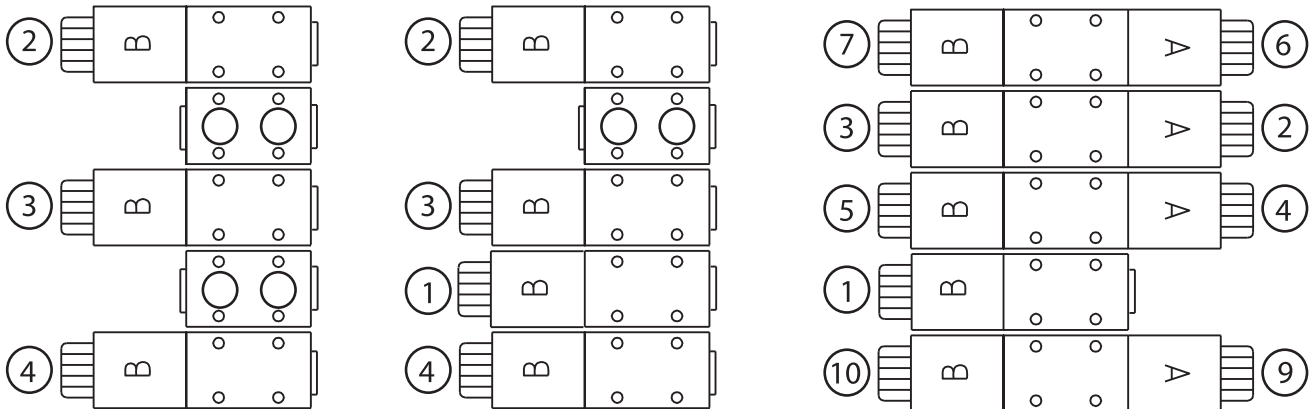


Fig. 31. Marking power plugs (variations may occur)

23. Put the cover into place over the directional valves.
 24. Perform steps 1–3 and 9 according to the instructions in the section Worm screw, Attachment.

Reverse assembly

Reverse dismantling and assembly is performed in the same way as normal dismantling and assembly, except that the plug(s) in the frame is/are used to disconnect the hitch.

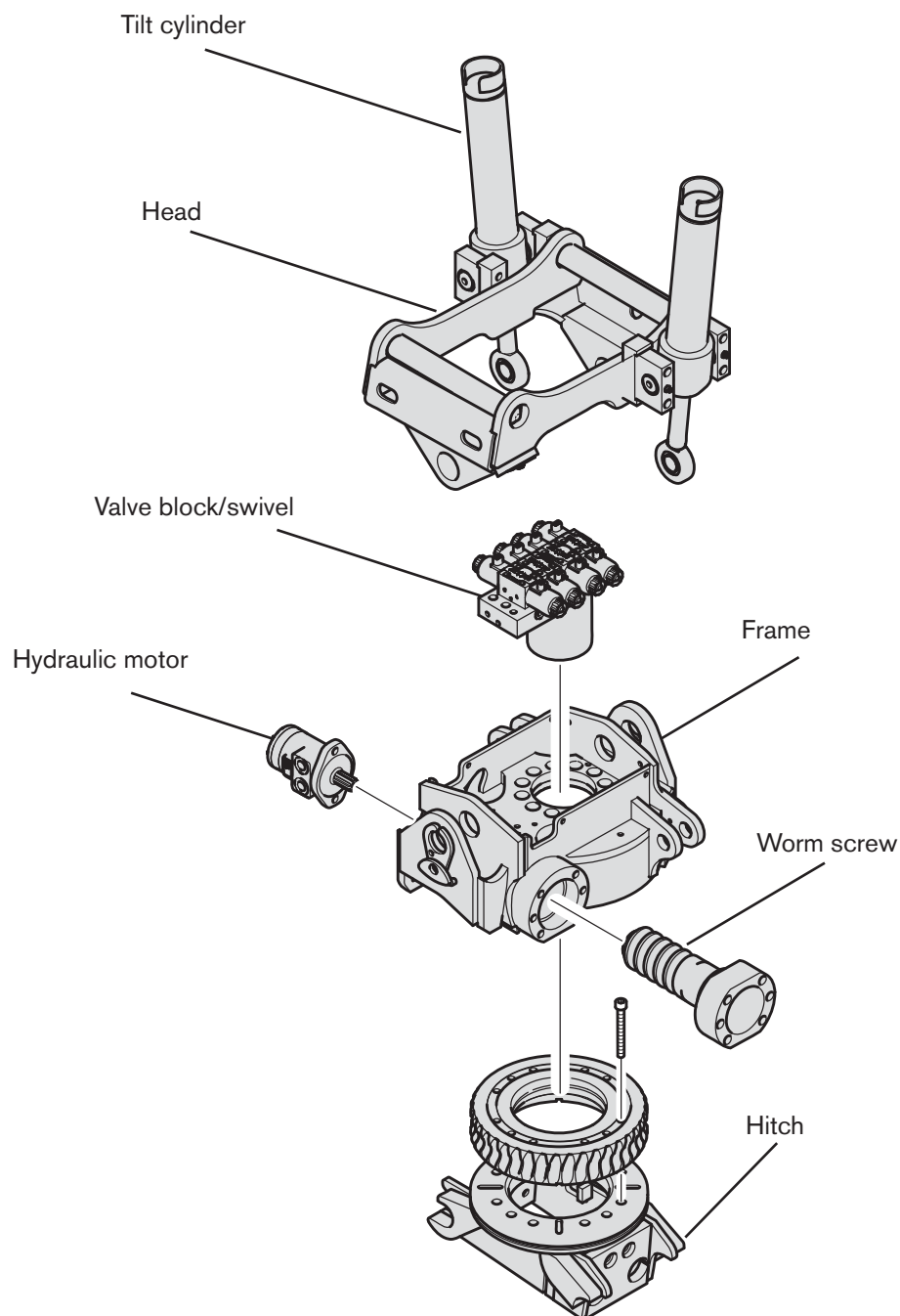


Fig. 32. Assembly diagram, reverse assembly

Checking of axial play

Axial play, worm wheel



CAUTION

Make sure that the hydraulic system is free of pressure before starting work.
Risk of personal injury.

NB:

All work that involves opening up connections to hydraulic parts requires a high degree of cleanness.

EC10

1. Remove the cover over the directional valves.
2. Remove the screw holding the unit box in place.
3. Remove the plug in the frame and check that none of the screw holes in the worm wheel are directly in front of the plug hole.

NB:

Never allow to rotate with a tool attached.

Checking of axial play

4. Attach the gauge for checking the axial play.

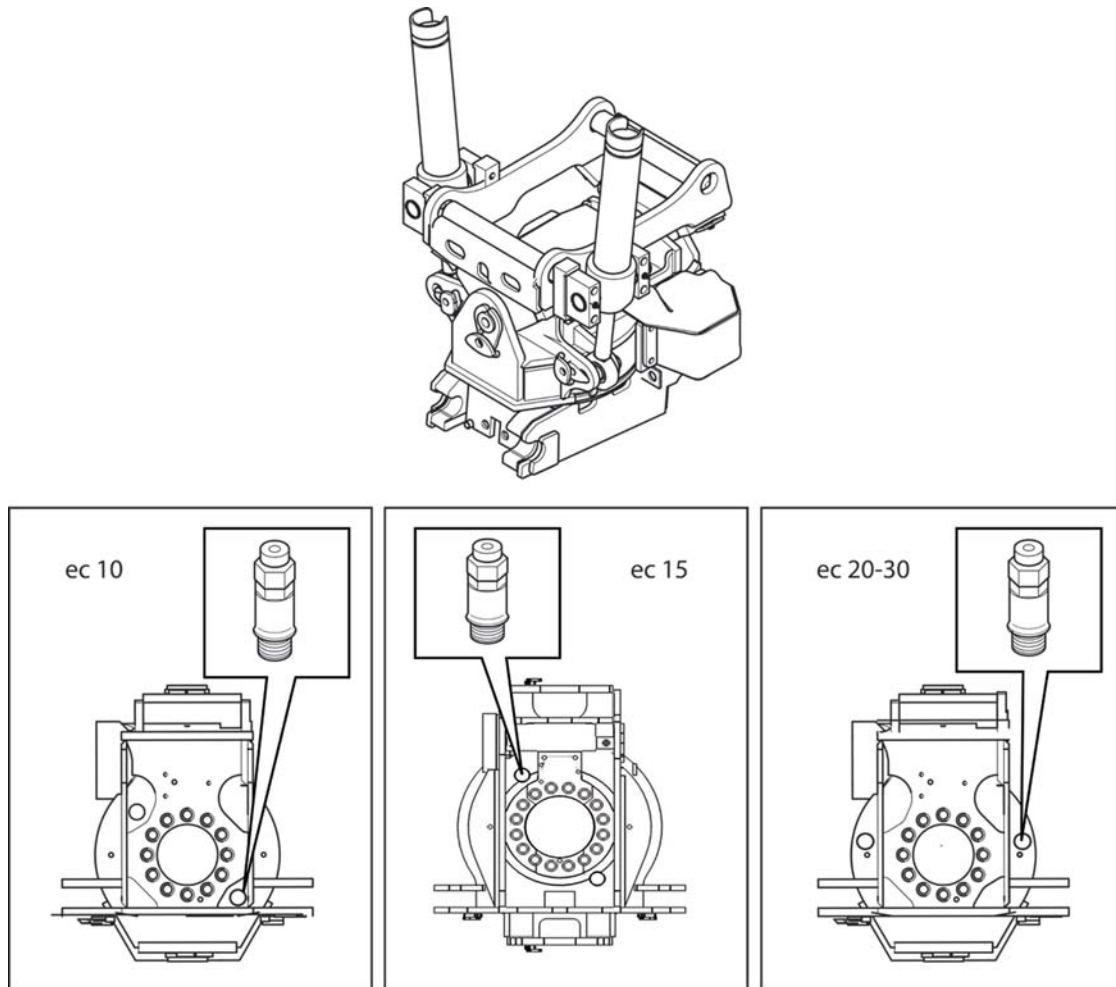


Fig. 33. Gauge for checking play

5. Set the gauge to zero, resting it against one of the fl at surfaces with the rotator resting fl at against the supporting surface.
6. Check the play by lifting the rotator up from the supporting surface. Probe with an iron bar between the hitch and frame to make sure that there is room for maximum play. Check that the play is within the indicated tolerance. If there is too much play, the rotator must be reshimmed.
7. Reshim according to the instructions in the section Worm wheel, Shimming.
8. Remove the gauge and attach the plug to the frame.
9. Attach the screw holding the unit box in place.
10. Put the cover over the directional valves.

EC15

1. Remove the cover over the directional valves.
2. Mark out the positions of the power plugs on the rotation valve, then remove the power plugs.
3. Disconnect the directional valve for rotation.
4. Plug any open connections.

5. Perform steps 3–8 according to the instructions for EC10.
6. Attach the directional valve for rotation.
7. Attach the power plugs on the rotation valve, following the markings made earlier.
8. Put the cover into place over the directional valves.

EC20 & 30

1. Perform steps 3–8 according to the instructions for EC10.

Axial play, worm screw

1. Remove the grease nipple from the screw housing for the worm screw.
2. Turn the lower part clockwise to make sure that worm screw reaches to the bottom.
3. Attach the gauge for checking the axial play and set it to zero, resting it against one of the fl at surfaces.

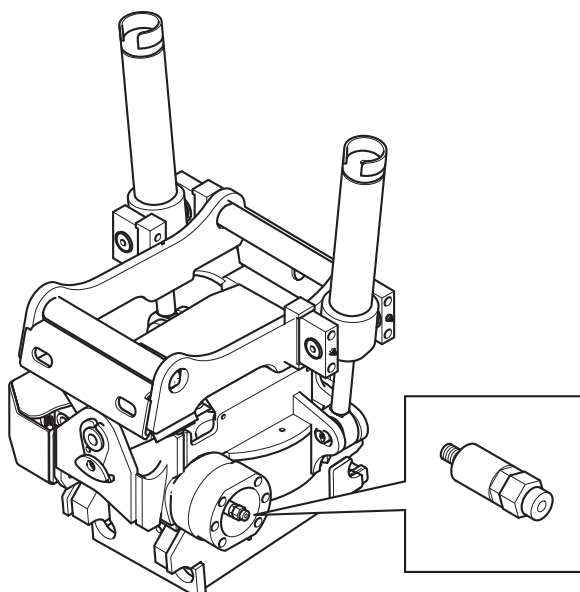
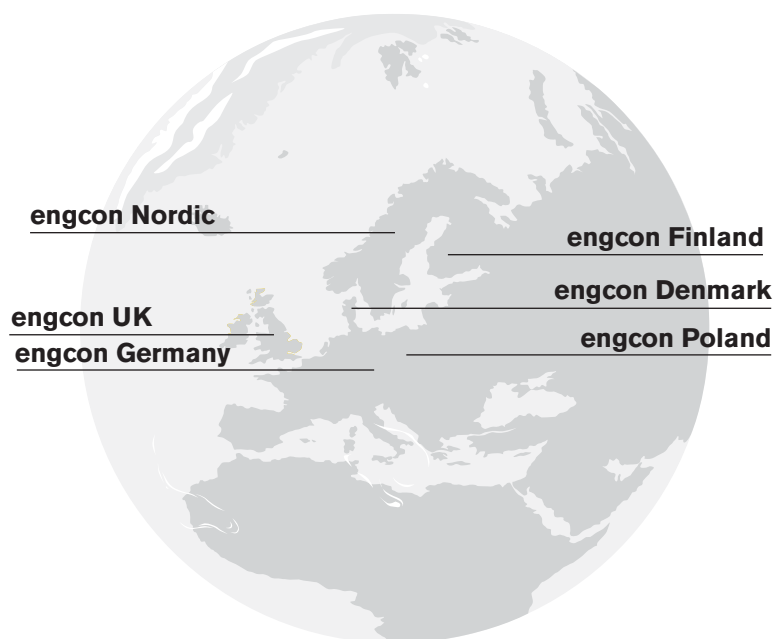


Fig. 34. Gauge for checking play

NOTE:

While checking the play, make sure that the lower part and the frame do not rotate in relation to each other.

4. Turn the lower part clockwise and check that the play is within the specified tolerance. If there is too much play, the worm screw must be reshimmed.
5. Reshim according to the instructions in the section Worm screw, Removal/attachment.
6. Remove the gauge and install the grease nipple in the screw housing for the worm screw.



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